We claim:

1. A recombinant nucleic acid encoding a thioredoxin *h* protein comprising a nucleic acid that hybridizes under high stringency conditions to a sequence complementary to that set forth in Figure 2 (SEQ ID NO:1).

2. The recombinant nucleic acid of claim 1 comprising a nucleic acid sequence as set forth in Figure 2 (SEQ ID NO:1).

3. A recombinant nucleic acid encoding a thioredoxin *h* protein comprising a nucleic acid having at least 75% sequence identity to a sequence as set forth in Figure 2 (SEQ ID NO:1).

4. A recombinant nucleic acid encoding an amino acid sequence as shown in Figure 1 (SEQ ID NO:2).

5. A host cell comprising the recombinant nucleic acid of claim 1, 2, 3, or 4.

6. An expression vector comprising the recombinant nucleic acid of claim 1, 2, 3, or 4 operably linked to a transcriptional regulatory sequence.

7. A host cell comprising an expression vector comprising the recombinant nucleic acid of claim 1, 2, 3, or 4 operably linked to a transcriptional regulatory sequence active said host cell.

8. A transgenic plant comprising the recombinant nucleic acid of claim 1, 2, 3, or 4.

9. A transgenic plant comprising an expression vector comprising the recombinant nucleic acid of claim 1, 2, 3, or 4 operably linked to transcriptional regulatory sequences active in said plant.

10. A transgenic plant comprising a host cell comprising an expression vector comprising the recombinant nucleic acid of claim 1, 2, 3, or 4 operably linked to a transcriptional regulatory sequence active in said cell.

11. The transgenic plant of claim 10 wherein said host cell is a seed cell.

12. A transgenic seed comprising the recombinant nucleic acid of claim 1, 2, 3, or 4 operably linked to transcriptional regulatory sequences active in said seed.

13. A method of expressing a thioredoxin *h* protein comprising culturing a host cell comprising the recombinant nucleic acid of claim 1 under conditions suitable for expression of said thioredoxin *h* protein.

14. A method of expressing a thioredoxin *h* protein comprising culturing a host cell comprising an expression vector comprising the recombinant nucleic acid of claim 1 operably linked to regulatory sequences active in said host cell under conditions suitable for expression of said thioredoxin *h* protein.

15. A method of expressing a thioredoxin *h* protein comprising culturing a transgenic plant comprising the recombinant nucleic acid of claim 1 under conditions suitable for expression of said thioredoxin *h* protein.

16. A method of expressing a thioredoxin *h* protein comprising culturing a transgenic plant comprising an expression vector comprising the recombinant nucleic acid of claim 1 operably linked to regulatory sequences active in said transgenic plant under conditions suitable for expression of said thioredoxin *h* protein.

17. A method of expressing a thioredoxin *h* protein comprising culturing the transgenic seed of claim 12.

18. The method of claim 13, 14, 15, 16, or 17 further comprising recovering said protein.

19. A recombinant thioredoxin *h* polypeptide encoded by the recombinant nucleic acid of claim 1.

20. A recombinant thioredoxin *h* polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 15 (SEQ ID NO:25).

21. The recombinant thioredoxin *h* polypeptide of claim 20 wherein said sequence is set forth in Figure 15 (SEQ ID NO:25).

22. An antibody that specifically binds to the recombinant polypeptide of claim 19.

23. The antibody of claim 22 wherein said antibody is a monoclonal antibody.

24. The antibody of claim 22 wherein said antibody inhibits a biochemical property of a recombinant thioredoxin *h* polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 1 (SEQ ID NO:2).

25. A method of identifying a bioactive agent that binds to a thioredoxin *h* polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 1 (SEQ ID NO:2), said method comprising:

a) combining said thioredoxin *h* polypeptide and a candidate bioactive agent; and

b) determining the binding of said candidate bioactive agent to said thioredoxin *h* polypeptide, whereby said bioactive agent is identified.

26. A method of identifying a bioactive agent that modulates an activity of a thioredoxin *h* polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 1 (SEQ ID NO:2), said method comprising;
a) combining said thioredoxin *h* polypeptide and a candidate bioactive agent(s); and
b) determining the effect of said candidate bioactive agent(s) on an activity of said thioredoxin *h* polypeptide.

27. The method of claim 25 or 26, wherein step a) is combining said thioredoxin *h* polypeptide and a library of candidate bioactive agents.

28. The method of claim 25 or 26 further comprising identifying said bioactive agent.

29. A recombinant nucleic acid encoding an NTR protein comprising a nucleic acid that hybridizes under high stringency conditions to a sequence complementary to that set forth in Figure 5A (SEQ ID NO:10).

30. The recombinant nucleic acid of claim 29 comprising a nucleic acid sequence as set forth in Figure 5A (SEQ ID NO:10).

31. A recombinant nucleic acid encoding an NTR protein comprising a nucleic acid having at least 75% sequence identity to a sequence as set forth in Figure 5A (SEQ ID NO:10).

32. A recombinant nucleic acid encoding an amino acid sequence as shown in Figure 4 (SEQ ID NO:9).

33. A host cell comprising the recombinant nucleic acid of claim 29, 30, 31, or 32.

34. An expression vector comprising the recombinant nucleic acid of claim 29, 30, 31, or 32 operably linked to a transcriptional regulatory sequence.

35. A host cell comprising an expression vector comprising the recombinant nucleic acid of claim 29, 30, 31, or 32 operably linked to a transcriptional regulatory sequence active said host cell.

36. A transgenic plant comprising the recombinant nucleic acid of claim 29, 30, 31, or 32.

37. A transgenic plant comprising an expression vector comprising the recombinant nucleic acid of claim 29, 30, 31, or 32 operably linked to transcriptional regulatory sequences active in said plant.

38. A transgenic plant comprising a host cell comprising an expression vector comprising the recombinant nucleic acid of claim 29, 30, 31, or 32 operably linked to a transcriptional

regulatory sequences active in said cell.

39. The transgenic plant of claim 38 wherein said host cell is a seed cell.

40. A transgenic seed comprising the recombinant nucleic acid of claim 29, 30, 31, or 32 operably linked to transcriptional regulatory sequences active in said seed.

41. A method of expressing an NTR protein comprising culturing a host cell comprising the recombinant nucleic acid of claim 29 under conditions suitable for expression of said NTR protein.

42. A method of expressing an NTR protein comprising culturing a host cell comprising an expression vector comprising the recombinant nucleic acid of claim 29 operably linked to regulatory sequences active in said host cell under conditions suitable for expression of said NTR protein.

43. A method of expressing an NTR protein comprising culturing a transgenic plant comprising the recombinant nucleic acid of claim 29 under conditions suitable for expression of said NTR protein.

44. A method of expressing an NTR protein comprising culturing a transgenic plant comprising an expression vector comprising the recombinant nucleic acid of claim 29 operably linked to regulatory sequences active in said transgenic plant under conditions suitable for expression of said NTR protein.

45. A method of expressing an NTR protein comprising culturing the transgenic seed of claim 40.

46. The method of claim 41, 42, 43, 44, or 45 further comprising recovering said protein.

47. A recombinant NTR polypeptide encoded by the recombinant nucleic acid of claim 29.

48. A recombinant NTR polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 4 (SEQ ID NO:9).

49. The recombinant NTR polypeptide of claim 48 wherein said sequence is set forth in Figure 4 (SEQ ID NO:9).

50. An antibody that specifically binds to the recombinant polypeptide of claim 47.

51. The antibody of claim 50 wherein said antibody is a monoclonal antibody.

52. The antibody of claim 50 wherein said antibody inhibits a biochemical property of a recombinant NTR polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 4 (SEQ ID NO:9).

53. A method of identifying a bioactive agent that binds to an NTR polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 4 (SEQ ID NO:9), said method comprising:
a) combining said NTR polypeptide and a candidate bioactive agent; and
b) determining the binding of said candidate bioactive agent to said NTR polypeptide, whereby said bioactive agent is identified.

54. A method of identifying a bioactive agent that modulates an activity of an NTR polypeptide comprising an amino acid sequence having at least 80% sequence identity with the sequence set forth in Figure 4 (SEQ ID NO:9), said method comprising;
a) combining said NTR polypeptide and a candidate bioactive agent(s); and
b) determining the effect of said candidate bioactive agent(s) on an activity of said NTR polypeptide.

55. The method of claim 53 or 54, wherein step a) is combining said NTR polypeptide and a library of candidate bioactive agents.

56. The method of claim 52 or 53 further comprising identifying said bioactive agent.

57. The transgenic plant of claim 9, wherein said recombinant nucleic acid is overexpressed in said transgenic plant in comparison to a non-transgenic plant of the same species.

58. The transgenic plant of claim 37, wherein said recombinant nucleic acid is overexpressed in said transgenic plant in comparison to a non-transgenic plant of the same species.

59. An isolated nucleic acid encoding a thioredoxin *h* protein comprising a nucleic acid that hybridizes under high stringency conditions to a sequence complementary to that set forth in Figure 2 (SEQ ID NO:1).

60. The isolated nucleic acid of claim 59 comprising a nucleic acid sequence as set forth in Figure 2 (SEQ ID NO:1).

61. An isolated nucleic acid encoding a thioredoxin *h* protein comprising a nucleic acid having at least 75% sequence identity to a sequence as set forth in Figure 2 (SEQ ID NO:1).

62. An isolated nucleic acid encoding an amino acid sequence as shown in Figure 1 (SEQ ID NO:2).

63. A transgenic plant comprising the isolated nucleic acid of claim 59, 60, 61, or 62.

64. A transgenic seed comprising the isolated nucleic acid of claim 59, 60, 61, or 62 operably linked to transcriptional regulatory sequences active in said seed.

65. A isolated nucleic acid encoding an NTR protein comprising a nucleic acid that hybridizes under high stringency conditions to a sequence complementary to that set forth in Figure 5A (SEQ ID NO:10).

66. The isolated nucleic acid of claim 65 comprising a nucleic acid sequence as set forth in Figure 5A (SEQ ID NO:10).

67. An isolated nucleic acid encoding an NTR protein comprising a nucleic acid having at least 75% sequence identity to a sequence as set forth in Figure 5A (SEQ ID NO:10).

68. An isolated nucleic acid encoding an amino acid sequence as shown in Figure 4 (SEQ ID NO:9).

69. A transgenic plant comprising the isolated nucleic acid of claim 65, 66, 67, 68, or 69.

70. A transgenic seed comprising the recombinant nucleic acid of claim 65, 66, 67, 68, or 69. operably linked to transcriptional regulatory sequences active in said seed.

71. A transgenic plant or at least a part of said plant overexpressing a barley thioredoxin *h* protein.

72. A transgenic plant or at least a part of said plant overexpressing a barley NADP-thioredoxin reductase protein.